

## NEW SUBSPECIES OF *DELIAS* HÜBNER (LEPIDOPTERA: PIERIDAE) FROM WEST PAPUA, INDONESIA

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### Abstract

*Delias nais odilae* subsp. n., *D. hapalina kaloni* subsp. n. and *D. leucias torini* subsp. n. are described from the Tembagapura area, West Papua, Indonesia. In addition, the systematic position of *D. weiskei sayuriae* K. Okano is revised, with the taxon placed as a form of *D. leucias huonensis* Jordan.

### Introduction

Tembagapura is a small mining town nestled in a valley south of Mt Carstensz at an altitude of 2000 m in West Papua, Indonesia. Recently in this area, some *Delias* Hübner species not recorded for some decades have been rediscovered (e.g. *D. inexpectata* Rothschild, *D. c. carstensziana* Rothschild) and several subspecies, *D. catocausta eefi* van Mastrigt, *D. callista calipulchra* Gerrits & van Mastrigt, *D. luctuosa gottsi* Gerrits & van Mastrigt and *D. fascelis amungme* van Mastrigt have been described (Gerrits and van Mastrigt 1992, van Mastrigt 1990, 1996).

If lowland species in the wider area are excluded there are another 17 *Delias* species represented in the area around Tembagapura township (Gotts and Pangemanan 2003). While some of these can be assigned to subspecies described from further afield, e.g. *D. rileyi yofona* Schröder & Treadaway, there remain several which have not yet been treated adequately in the literature. The descriptions of three new *Delias* subspecies are recorded here. In addition, we propose a revision of another previously described subspecies, *D. weiskei sayuriae* K. Okano, in the light of additional specimens and field observations.

Specimen depositories are abbreviated as follows: AM - Australian Museum, Sydney; RG - R. Gotts collection; GG - G. Gerrits collection.

### *Delias nais odilae* subsp. n.

(Figs 1-8)

*Types. Holotype* ♂, INDONESIA (WEST PAPUA): Tembagapura (TBP), Mulki R., 2100 m, 19.iv.1992 (in AM). *Paratypes*: 1 ♀, Mile 52, 1100 m, Mimika, 15.ii.2001 (AM); 1 ♂, 1987 (RG); 1 ♂, ii.1991 (GG); 1 ♂, vi.1991 (RG); 1 ♀, 2.vii.1992 (RG); 1 ♀, 1992 (RG); 1 ♀, 24.i.1992 (GG); 1 ♂, 19.vi.1992 (RG); 1 ♂, 11.xi.1992 (RG); 1 ♂, 16.xii.1992 (RG); 2 ♂♂, 1995 (RG); 1 ♂, 1 ♀, TBP, Mulki R., 2100 m, 1996 (RG); 1 ♀, 1997 (RG); 1 ♀, Mimika, Mile 52, 1100 m, 15.ii.2001 (RG); 1 ♀, Mimika, Mile 52, 1100 m, 31.x.2001 (RG).

*Description.* Male (Figs 1-2). Forewing average length 24 mm. Head black (when alive the eyes are bright yellow); thorax grey, ventrally black; abdomen

white with grey dorsal surface. Forewing upperside white, costa narrowly black, becoming broader towards apex; apex black from mid-costa to tornus in smooth arc with indentations at the veins; cell white. Forewing underside dark grey-brown, white at inner margin (space 1A+2A), occasionally some white in space above; three small white subapical spots. Hindwing upperside white with narrow but fairly bold black terminal margin. Hindwing underside black with a large maroon spot almost filling each space including discal cell, terminal and anal margins black, veins very thinly black. Maroon area smaller in three median spaces ( $M_1$  to  $M_3$ ), broad black central patch with extensions along veins. A bold black line separates basal spot and continues below cubitus to connect with central dark area.

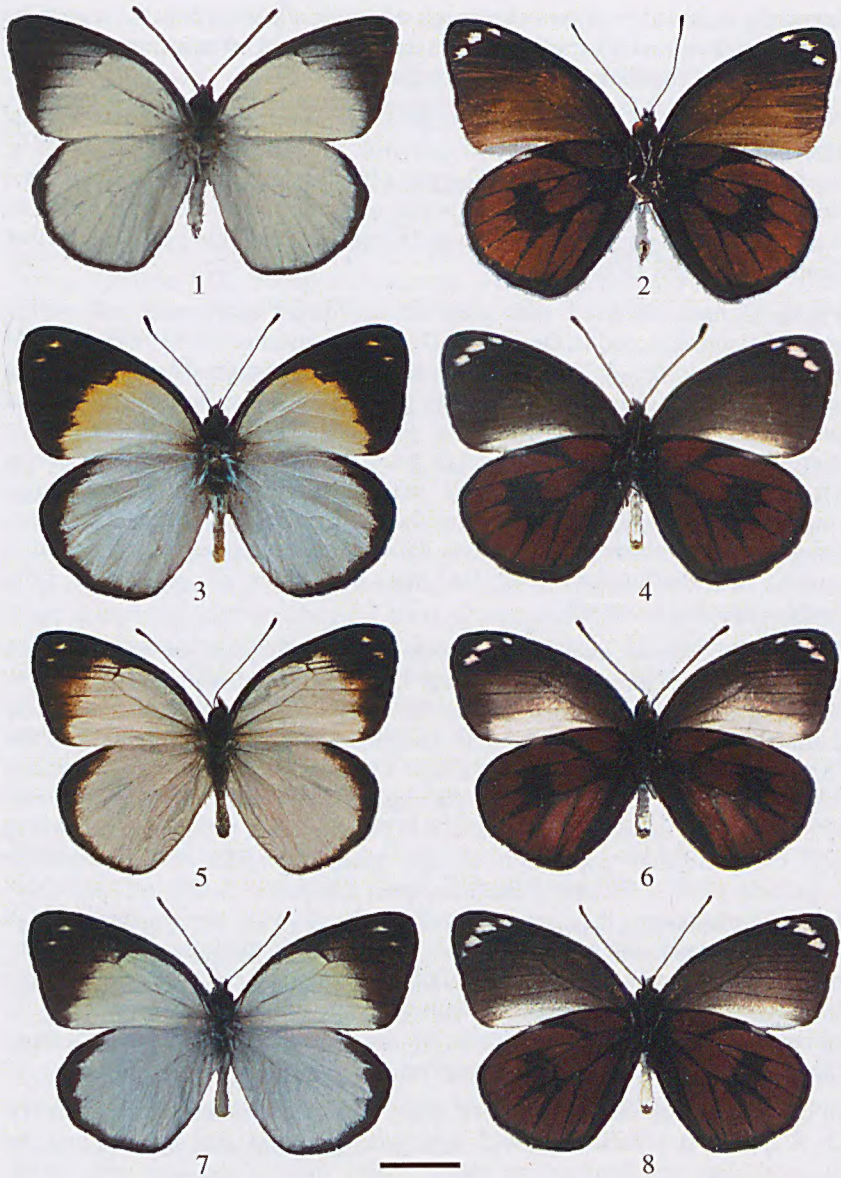
Female. Three forms, dark (Figs 3-4), light (Figs 5-6) and normal (Figs 7-8). Forewing average length 24 mm. Colour and pattern generally as in male, but with the following differences: forewing upperside has two small white subapical spots, the posterior slightly weaker; in the dark form the black outer margin is broader and dips inward slightly to just include the discocellular veins. The light form is similar to lighter males but with the addition of the subapical white spots. In the darkest specimen the white area becomes increasingly yellow distally. Forewing underside with white inner margin extending fully into space  $CuA_2$  above and, except in the very darkest specimens, with slight paling of the discal area. Hindwing upperside white with a bold black terminal margin, wider at the apex and much wider generally than in males; underside as in male.

*Etymology.* Named after a grandchild, Odile Gotts.

*Distribution.* The southern slopes and upper valleys of the Sudirman Range, south central West Papua, Indonesia, between 1100 and 2100 m.

*Comments.* Many specimens from Tembagapura were undated and the location, where given, was stated as 'Waa River, 2100 m'. This is actually a reference to the Mulki River, a tributary of the River Waa above Tembagapura township. All unlabelled Tembagapura specimens may safely be assumed to have been caught there. *D. nais* does not occur at higher collecting locations in the area. The 'Mimika, Mile 52' references apply to the main access road from Timika to Tembagapura in the Mimika district. Most of the Mulki River specimens were caught by Norris Pangemanan and his children. Mile 52 is a recent location, found by R. Gotts, who collected the specimens, mainly females, listed from there. This location is separated from Tembagapura and the nearby collecting areas by a steep mountain ridge. Access to the town is via the Hanekam Tunnel.

*Delias nais* Jordan has been divided into numerous subspecies, some of which are no longer regarded as valid (see Parsons 1998). Individual variation within a subspecies is often greater than supposed differences between subspecies, especially with regard to the pattern and colour of the



**Figs 1-8.** *Delias nais odilae* from Tembagapura, W. Papua; uppersides, left; undersides, right. (1-2) male; (3-4) female, dark form; (5-6) female, light form; (7-8) female, normal form. Scale bar = 10 mm.

hindwing underside. On the other hand, the upperside wing patterns tend to be more consistent, with variations in the extent of the black markings providing a useful guide for the separation of subspecies.

Nine subspecies of *D. nais* have so far been described and to date at least three of them have been synonymised with the nominate subspecies *D. n. nais*, viz. *rubrina* van Eecke by Roepke (1955) and *keysseri* Rothschild and *entima* Jordan by Parsons (1998), while one subspecies, *D. n. maprikenis* Yagishita, based on a single specimen, is regarded as unsafe pending further captures (Parsons 1998).

Problems have occurred with establishing correct taxonomic rank within several *Delias* species. In the case of *D. nais*, Yagishita *et al.* (1993) raised *D. n. denigrata* Joicey & Talbot to species level to accommodate *D. denigrata maruyamai* Yagishita as a subspecies and moved *D. n. holophaea* Roepke into this group as *D. d. holophaea*. Since *D. denigrata* is not obviously dissimilar to various subspecies of *D. nais*, the two *D. denigrata* subspecies are here treated as subspecies of *D. nais* so that the broadest comparisons might be made. Parsons (1998), on the other hand, has synonymised two subspecies (see above) and has then called the larger group 'variable'. It is against this background that the new subspecies *D. n. odilae* from Tembagapura is proposed.

In all the specimens used for comparison in this study the underside pattern was found to be unreliable as a guide to identification, with one exception. The hindwing markings of specimens from Kerowagi, Papua New Guinea, are distinctly darker and less red in hue. Diagnosis here is therefore based on the extent of the black upperside markings. These are broadest in *D. n. entima*, slightly narrower in the Kerowagi population (ssp. undescribed - see below), intermediate in the nominate subspecies (Parsons 1998 included *D. n. entima* and the Kerowagi population in this group in spite of the dissimilar uppersides) and in the *denigrata/holophaea* subspecies, while in *D. n. odilae* from Tembagapura they are markedly reduced with the subapical black margin well separated from the discocellular veins on the forewing. The space between the margin and the discocellulars, i.e. the proximal parts of  $M_1$  and  $M_2$ , is usually streaked and dusted with a mixture of black and white scales. In some cases the outer black area reaches the discocellulars but does not cross them as it does in all the other subspecies examined.

In the females the same differences apply. The most common female form of *D. n. odilae* is a dark form with upperside black margins not abutting the discocellulars but approaching more closely than is the case with males. However, *D. n. odilae* females occur in two other forms, one apically more broadly dark and the other much lighter on both sides of the forewing. Even in the darker form the dark forewing margin does not enter the cell but ends abruptly at the discocellulars and immediately recedes in the subsequent spaces.

Specimens from Kerowagi, the most frequently caught subspecies in Papua New Guinea, have for many years been supplied to collectors erroneously as *D. n. aegle* Joicey & Talbot. Parsons (1998) synonymised them with the nominate subspecies in spite of marked differences in the extent of the forewing upperside black margins.

***Delias hapalina kaloni* subsp. n.**

(Figs 9-12)

*Types.* *Holotype* ♂, INDONESIA (WEST PAPUA): Tembagapura (TBP), Mulki R., 2100 m, 1981 (in AM). *Paratypes*: same data as holotype, except: 1 ♂, 1990; 1 ♂, 1991; 1 ♂, 1994; 1 ♂, 1995 (RG); 1 ♀, 1995 (RG); 1 ♀, 1995 (GG). No further collection data available.

*Description.* Male (Figs 9-10). Forewing length 19 mm to 23 mm. Head black; thorax grey, ventrally darker and dusted with yellow; abdomen white with dorsal grey darkening anteriorly. Forewing upperside white with costa narrowly black; apex broadly black, slightly irregular at inner margin tapering downwards to hook inwards slightly at tornus. One or two tiny, faint subapical spots sometimes present. Forewing underside white; costa narrowly black with curved discocellular bar; apex black but reduced with a smooth arc at inner margin leaving central part of upperside black margin visible through wing; a tapering yellow subapical band composed of five spots, the second and third prominent, fourth and fifth barely discernable. Hindwing upperside white with very fine black terminal margin. Hindwing underside white with bold yellow subbasal streak enclosed in a black basal band which is contiguous with a black band parallel to anal margin and branching to form a post-discal band and tornal black margin which tapers to a thin edged line above vein M<sub>3</sub>. Along anal margin a broad bar with yellow-black suffusion runs from base to mid-discal area where black tornal margin begins. The post-discal black band has a variable narrow distal edging of red which culminates in a bolder red spot at anal angle; discal area centrally pale yellow.

Female (Figs 11-12). As in male, but with the following differences: forewing length 26 mm. Forewing upperside with two clearly-defined white subapical spots, third subapical spot rarely present and never well-defined; underside as in male but may have a sixth subapical yellow spot. Hindwing upperside white with bold black terminal margin broken by white scaling along the veins; underside as in male but with broader terminal margin of variable width, widest at the tornus and narrowest midway between each pair of veins.

*Etymology.* Named after a grandchild, Kalon Gotts.

*Distribution.* Above 2000 m in valleys of the various tributaries of the Waa River, south central West Papua, Indonesia.

*Comments.* Five subspecies of *Delias hapalina* Jordan were listed by D'Abbrera (1990). Two of these, *D. tessei* Joicey & Talbot and *D. conspectirubra* Joicey & Talbot have now been separated from *D. hapalina*

(Yagishita *et al.* 1993) and a sixth subspecies, *D. h. kerowagiensis* Yagishita has been synonymised with *D. h. amoena* Roepke (Parsons 1998). *D. hapalina* is not a common species in the Tembagapura area compared to its conspecifics. Only two females from the area are known to the authors.

The various subspecies of *D. hapalina* are readily distinguished from each other by sexually dimorphic variation in wing pattern except in the case of *D. h. amoena* (from Pass Valley) and *D. h. kaloni* (from Tembagapura). Even though these two subspecies are widely separated geographically, in both cases the females closely resemble the males but with broader dark margins on the hindwings. The females of *D. h. kaloni* have heavier dark black margins, both above and below, than is the case with *D. h. amoena*.

Males of *D. h. kaloni* appear slightly darker than those of *D. h. amoena*, having broader forewing upperside dark margins (evident on the underside as a slightly larger grey 'print-through' area from the upperside) and better-delineated black veins crossing the hindwing underside post-discal white band. This band also appears slightly narrower than on *D. h. amoena* because the black and red band it encloses is usually broader than on that subspecies. Also somewhat bolder is the terminal black edging in the central and upper parts of the hindwing underside in *D. h. kaloni*.

Comparisons are based on numerous specimens of all subspecies, using material in the GG and RG collections plus published photographs. Unfortunately many of the specimens of the new subspecies available for study came with incomplete collecting data but their general place of origin is not in doubt.

### ***Delias leucias torini* subsp. n.**

(Figs 13-16)

*Types.* *Holotype* ♂, INDONESIA (WEST PAPUA): Tembagapura (TBP), Mulki R., 2100 m, 14.viii.1981 (in AM). *Paratypes*: TBP, same data as holotype, except: 1 ♂, xi.1990 (RG); 3 ♂♂, 4.x.1991 (RG); 1 ♀, 14.v.1992 (RG); 1 ♀ 7.vi.1992 (RG); 1 ♂, 3.xi.1992 (RG); 1 ♂, 27.xi.1992 (RG); 1 ♂, 30.v.1993 (RG); 1 ♂, 21.ii.1995 (RG); 5 ♂♂, 20.ii.2001(RG); 1 ♂, TBP, Uteki R., 2050 m, 22.ii.2001 (RG).

*Description.* Male (Figs 13-14). Forewing length 20 mm. Forewing upperside white with costa narrowly black; apex broadly black, smoothly concave inner margin tapering to tornus; two tiny, faint subapical spots sometimes absent. Forewing underside yellow, fading to white at inner margin; black apical margin as on upperside; a tapering, inwardly concave yellow subapical arc of four spots, a fifth sometimes faintly present parallel and adjacent to termen. Hindwing upperside white with very fine black terminal margin. Hindwing underside black with bold creamy patch in central and upper discal area; red subbasal streak becoming white near costa; rounded red spot centered in black anal margin near proximal extremity of central patch; narrow post-discal red band edged more narrowly with white on distal edge.



**Figs 9-16.** *Delias* spp. from Tembagapura, W. Papua; uppersides, left; undersides, right. (9-12) *D. hapalina kaloni*: (9-10) male; (11-12) female. (13-16) *D. leucias torini*: (13-14) male; (15-16) female. Scale bar = 10 mm.

Female (Figs 15-16). Similar to male, but with forewing upperside black margins much broader, particularly at tornus; white subapical spots more clearly-defined; underside dark margin as above but slightly narrower at tornus. Hindwing upperside more transparent white with dark underside markings visible; broader black terminal margin inwardly diffused due to grey of underside; underside as in male.

*Etymology.* Named after a grandchild, Torin Gotts.

*Distribution.* Altitudes around 2000 m and higher on the southern slopes of the Sudirman Range, south central West Papua, Indonesia, possibly extending as far west as the Weylend Mountains where somewhat similar forms occur.

*Comments.* In a pinned series the Tembagapura subspecies *D. l. torini* is readily distinguished from other subspecies of *D. leucias* Jordan by appearing darker on the underside owing, on the hindwing, to the reduced size of the pale central patch and the thinness of the outer white band and, on the forewing, to the outer margin being inwardly curved rather than slightly angular. Only occasionally is a specimen of another subspecies found to approach the underside pattern of the Tembagapura specimens and in such rare cases the slightly hooked apex of the pale patch and the width of the hindwing upperside margin may be used for diagnosis.

In recent years a number of forms of *D. leucias* have been collected in West Papua but only two other subspecies, *D. l. leucias* from Mt Goliath and *D. l. huonensis* Talbot from Papua New Guinea, have been described. (Two subspecies of *D. nieuwenhuisi* were formerly included.). *D. leucias* is probably the most common of all the *Delias* species found in the Tembagapura area. There is only small sexual dimorphism and identification of this species cannot be based on divergence among the females of the various populations, which are similar to males but with wider black margins on the hindwing uppersides.

*D. l. leucias* is recorded from the Snow Mountains and the eastern part of West Papua, especially the Baliem and Pass Valleys. Specimens from the Star Mountains, to the south-east, and from Tabubil, on the adjacent Papua New Guinea side of the border, are similar. These specimens, though somewhat variable in small details, share one characteristic: the hindwing verso central pale patch usually parallels closely or bonds with the inner edge of the post-discal red band in the upper distal quadrant (spaces Sc and M<sub>1</sub>). In the other subspecies the black base colour intrudes boldly to separate these two colour areas so that the central patch is virtually surrounded by black.

The other named subspecies, *D. l. huonensis*, is found further east in Papua New Guinea and, while the hindwing underside central patch is surrounded by black as in *D. l. torini*, the forewing underside is a deeper orange yellow, sometimes suffused with red, and the hindwing pale patch is noticeably larger. In *D. l. huonensis* the outer white band of the hindwing verso is very



boldly defined while it is much weaker in *D. l. torini*. Tembagapura is much further west, closer to the Weyland Mountains. Specimens from the Weyland area have more in common with the Tembagapura subspecies but they are not identical. Further study is needed on these.

**Discussion**

Specimens referred to in this paper as *D. l. huonensis* Jordan are from Kerowagi, Simbu Province, Papua New Guinea, and not from the Huon Peninsula. The taxon *sayuriae* Okano applies to a form that resembles *D. weiskei* Ribbe in that the white band of the hindwing underside is largely absent. Okano (1989) placed this taxon as a subspecies of *D. weiskei* on the basis of two males from Kerowagi, Papua New Guinea. Since this has been found to be sympatric with *D. l. huonensis* in the mountains above Kerowagi where intergrades have also been found to occur, it is here synonymised with that subspecies as *D. l. huonensis* f. *sayuriae*.

The following key is offered as a guide to diagnosis of the subspecies of *D. leucias*.

Key to *Delias leucias* subspecies

- 1 Forewing underside base colour pure yellow ..... 3
- Forewing underside base colour has orange hue or is suffused with orange red ..... 2
- 2 Hindwing underside white band is bold and wider than the red band in CuA<sub>1</sub> ..... *D. l. huonensis*
- Hindwing underside white band is largely incomplete ..... *D. l. huonensis* f. *sayuriae*
- 3 Hindwing underside pale patch close to outer red band in Rs and M<sub>1</sub> ..... *D. l. leucias*
- Hindwing underside pale patch distal margin broadly bounded by black in M<sub>1</sub> and most of Rs ..... 4
- 4 Hindwing underside pale patch distal margin strongly convex in M<sub>1</sub> ..... *D. l. leucias*
- Hindwing underside pale patch distal margin not obviously convex in M<sub>1</sub> ..... 5
- 5 Hindwing upperside black border is less than 1 mm in width ..... *D. l. leucias*
- Hindwing upperside black border reaches 1 mm or more in width ..... *D. l. torini*

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## References

- D'ABRERA, B. 1990. *Butterflies of the Australian Region*. 3rd, revised edition. Hill House, Melbourne & London; 416 pp.
- GERRITS, F. and van MASTRIGT, H. 1992. New results on *Delias* from the central mountain range of Irian Jaya. *Treubia* 30(3): 381-402.
- GOTTS, R. and PANGEMANAN, N. 2003. *Mimika Butterflies*. P.T. Freeport Indonesia, Timika, West Papua; 287 pp.
- OKANO, K. 1989. Descriptions of four new butterflies of the genus *Delias* (Lep.: Pieridae), with some notes on *Delias*. *Tokurana* 14(2-3): 1-6.
- PARSONS, M. 1998. *The Butterflies of Papua New Guinea: their systematics and biology*. Academic Press, London; xvi + 736 pp, xxvi + 136 pls.
- ROEPKE, W. 1955. The butterflies of the genus *Delias* Hübner (Lepidoptera) in Netherlands New Guinea. *Nova Guinea* 6: 185-260.
- van MASTRIGT, H.G. 1990. New (sub)species of *Delias* from the central mountain range of Irian Jaya. *Tijdschrift voor Entomologie* 133: 197-204.
- van MASTRIGT, H.G. 1996. New species and subspecies of *Delias* Hübner [1819] from the central mountain range of Irian Jaya, Indonesia (Lepidoptera, Pieridae). *Neue Entomologische Nachrichten* 38: 21-55, 6 pls.
- YAGISHITA, A., NAKANO, S. and MORITA, S. 1993. *An illustrated list of the genus Delias Hübner of the world*. Khepera Publishers, Tokyo, Japan.